



John D. Catlett
Director

DEPARTMENT OF CODE ADMINISTRATION

301 King Street
Room-4200
Alexandria, Virginia 22314

Phone (703) 746-4200
Fax (703) 549-4589
alexandriava.gov

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TO: CODE ADMINISTRATION CUSTOMERS AND STAFF

FROM: JOHN CATLETT, DIRECTOR

SUBJECT: GAS SYSTEM TESTING

This policy is intended to clarify gas test requirements as provided in the Virginia Construction Code.

When replacing a gas or other fueled fired piece of equipment, a permit is required as noted in VCC Sections 108.1 and 108.2. Questions may be directed to the Mechanical/Plumbing Field Supervisor at 703.898.5314 or contact the Permit Center at 703.746.4200.

2009 International Fuel Gas Code (IFGC) Sections regarding inspection and testing:

406.1 General. *Prior to acceptance and initial operation, all piping installations shall be inspected and pressure tested to determine that the materials, design, fabrication and installation practices comply with the requirements of this code.*

- This section requires a visual inspection and pressure test after the gas system is put together and before it is placed in to operation.

406.1.1 Inspections. *Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly or pressure tests as appropriate. Supplementary types of nondestructive inspection techniques, such as magnetic- particle, radiographic, ultrasonic, etc., shall not be required unless specifically listed herein or in the engineering design.*

- This inspection will check pipe sizing, protection from damage, use of proper fittings, pipe support, and general condition of the system before any work is concealed. This would be a gas pipe rough-in inspection and it is required before a framing inspection can be obtained.

406.1.2 Repairs and additions. *In the event repairs or additions are made after the pressure test, the affected piping shall be tested.*

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Minor repairs and additions are not required to be pressure tested provided that the work is inspected and connections are tested with a noncorrosive leak-detecting fluid or other approved leak-detecting methods.

- Occasionally, very small sections of pipe are added to the system for generators or other equipment. A leak-detecting fluid can be utilized in lieu of a pressure test when work is limited to one section of pipe (10' or less), all of the work is located in the same room or on the exterior of the building, and there are a limited number of joints. The leak-detecting fluid must be provided by the permit holder at the time of the inspection and someone must be present to apply it.

406.1.3 New branches. *Where new branches are installed to new appliances, only the newly installed branches shall be required to be pressure tested. Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or other approved leak-detecting methods.*

- When a new branch is added from the meter location to a new appliance or piece of equipment, that section shall be tested. The point of attachment between the new pipe and the existing point of delivery piping (meter) can be soap (leak detector) tested so that the system can remain on during the installation and testing phase. If the new line meets the limitations established by the comments with 406.1.2, then those procedures can be followed.

406.1.4 Section testing. *A piping system shall be permitted to be tested as a complete unit or in sections. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless two valves are installed in series with a valved "telltale" located between these valves. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve-closing mechanism, is designed to safely withstand the test pressure.*

- On large jobs, it is not uncommon to have multiple inspections of the gas system. Testing shall be in accordance with this section.

406.1.5 Regulators and valve assemblies. *Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication.*

- Regulators and/or valves are not required to be installed in the gas system for testing if they have been pre-tested and/or it would be detrimental to the assembly to be under test.

406.2 Test medium. *The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used.*

406.3 Test preparation. *Pipe joints, including welds, shall be left exposed for examination during the test.*

Exception: Covered or concealed pipe end joints that have been previously tested in accordance with this code.

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- During the rough-in gas line inspection and any underground/under slab inspections, all pipe and joints must be visible for inspection. This is not required for the final visual and pressure test inspection.

406.3.1 Expansion joints. *Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.*

406.3.2 Appliance and Equipment isolation. Appliances and equipment that are not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

406.3.3 Appliance and equipment disconnection. *Where the piping system is connected to appliances or equipment designed for operating pressures of less than the test pressure, such appliances or equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s).*

406.3.4 Valve isolation. *Where the piping system is connected to appliances or equipment designed for operating pressures equal to or greater than the test pressure, such appliances or equipment shall be isolated from the piping system by closing the individual appliance or equipment shutoff valve(s).*

406.3.5 Testing precautions. *All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage, and bracing suitably designed to resist test pressures shall be installed if necessary. Prior to testing, the interior of the pipe shall be cleared of all foreign material.*

- Sometimes more is not better! Pressure testing can be dangerous. Caps, fittings and even piping have been known to explode. The least recognized pressure should be utilized to accomplish the test. Appropriate precautions should be taken to protect anyone who may come in contact with the system while under test.

406.4 Test pressure measurement. *Test pressure shall be measured with a manometer or with a pressure-measuring device designed and calibrated to read, record or indicate a pressure loss caused by leakage during the pressure test period. The source of pressure shall be isolated before the pressure tests are made. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than five times the test pressure.*

- For typical systems from inches of water column up to and including 5 pounds, Alexandria requires that the gauge be 30 psi or less in maximum pressure. The test gauge shall be in good repair with a clear face cover to protect the test needle, calibration and allow for marking the initial pressure with a grease pencil or other removable marking.

406.4.1 Test pressure. *The test pressure to be used shall be no less than 1 1/2 times the proposed maximum working pressure, but not less than 3 psig (20 kPa gauge), irrespective of design pressure. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield*

strength of the pipe.

- Alexandria allows the use of up to a 30 psi gauge on systems up to and including 5 psi. However, the following test pressures are to be followed: 3 psi minimum on up to and including a 20 psi gauges if the gage is in one pound increments, and 10 psi minimum on gauges between 20 and 30 psi. The gauge on rough-in and final inspections shall be placed at the meter location for new services. It shall be placed just before the

406.4.2 Test duration. *Test duration shall be not less than 1/2 hour for each 500 cubic feet (14 m³) of pipe volume or fraction thereof. When testing a system having a volume less than 10 cubic feet (0.28m³) or a system in a single-family dwelling, the test duration shall be not less than 10 minutes. The duration of the test shall not be required to exceed 24 hours.*

406.5 Detection of leaks and defects. *The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects.*

Any reduction of test pressures as indicated by pressure gauges shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

- Generally, there can be no loss of pressure during the inspection. However, there can be a slight adjustment during periods of falling temperatures. Should this occur, the pressure must stabilize and be at or above the approved testing pressure noted above for the inspection to be approved.

406.5.1 Detection methods. *The leakage shall be located by means of an approved gas detector, a noncorrosive leak detection fluid, or other approved leak detection methods. Matches, candles, open flames, or other methods that could provide a source of ignition shall not be used.*

- Performed by the permit holder.

406.5.2 Corrections. *Where leakage or other defects are located, the affected portion of the piping system shall be re-paired or replaced and retested.*

- Performed by the permit holder and a re-inspection requested.

406.6 System and equipment leakage test. *Leakage testing of systems and equipment shall be in accordance with Sections 406.6.1 through 406.6.4.*

- Before the system is approved for use it shall be re-tested as part of the gas final inspection on new construction and as part of the gas line final for additions and alterations of the gas system. This insures that the pipe was not damaged during construction and that added fittings are gas tight.

406.6.1 Test gases. *Leak checks using fuel gas shall be permitted in piping systems that have been pressure tested in accordance with Section 406.*

- Although the code allows the use of fuel gas as part of this test, this would require the

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coordination of the gas pipe final with the permit holder and inspector. The permit holder would need to provide leak detector and be available to soap joints and fittings as noted in 406.1.2, 406.1.3, and 406.1.4. The final pressure test noted above shall serve as the system leak check noted in this section.

406.6.2 Before turning gas on. *During the process of turning gas on into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all valves at unused outlets are closed and plugged or capped.*

- This occurs as part of the gas pipe final inspection air testing.

406.6.3 Leak check. *Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage. Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.*

- It is the responsibility of the permit holder to check for leaks beyond the shut off valves on each piece of equipment once the system is approved for use.

406.6.4 Placing appliances and equipment in operation. *Appliances and equipment shall not be placed in operation until after the piping system has been checked for leakage in accordance with Section 406.6.3 and determined to be free of leakage and purged in accordance with Section 406.7.2.*

- To place the gas system in to operation, the gas line final needs to take place along with a mechanical final inspection. The mechanical final inspection is needed to verify that gas utilization equipment is properly connected and vented. Should the mechanical system not be completed, but equipment is ready for safe operation, a mechanical final can be requested for temporary use. The final inspection will be noted as “conditional” on the inspection results ticket.